

# Green Building & *Above Code Performance*

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# U.S. Department of Energy ~ Energy Efficiency & Renewable Energy

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- Building Technologies Program –
  - Integrated portfolio of programs
    - Works to improve the efficiency of:
      - Buildings
      - Equipment
      - Components



# U.S. Department of Energy ~ Energy Efficiency & Renewable Energy

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## ○ Building Technologies Program –

- The building program demonstrates the bottom-line benefits of:
  - New technologies & building practice
  - And promotes their widespread use



# DOE ~ Building America

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## ○ Building America ~

- Industry-driven, private/public partnership sponsored by the U.S. Department of Energy
- Works with members of the home-building industry to:
  - Accelerate the development & adoption of innovative building processes & technologies for production housing
  - Produce quality homes that use less energy, without costing more to build



# Building America ~ BIRA & ZEH

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- Building America's goal is:
  - To make available the knowledge and technology to build marketable homes that generate as much energy as they consume on an annual basis by the year 2020
    - This will require substantial advances in the efficiency of all energy-consuming features of the homes and the integration of energy generation into the homes



# Building America ~ What We Do

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**Building America ~ Conduct systems engineering research to:**

- Produce homes on a community scale that use on average 30% to 90% less energy; whole-house
- Integrate onsite power systems leading to “zero-energy” [\(ZEH\)](#) homes that will ultimately produce as much energy as they use by 2020
- Help home builders reduce construction time & waste
- Improve builder productivity
- Improve home comfort and durability
- Provide new product opportunities to manufacturers & suppliers
- Implement innovative energy- & material-saving technologies



# Building America ~ Who We Work With

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Building America Has  
six consortia,  
comprised of a total of  
more than 270  
companies



**Building Science Consortium**  
*Architecture and Building Science*



**IBACOS**



# Building America ~ Who We Work With

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- Who We Work With ~
  - Members of each consortium include:
    - Architects
    - Engineers
    - Builders
    - Equipment manufacturers
    - Material suppliers
    - Community planners
    - Mortgage lenders
    - Contractor trades



# Building America ~ Teams

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- ConSol, the team leader of the Building Industry Research Alliance (BIRA) team is:
  - >25 years working in building industry
  - Newest consortium to join the program (2003)
  - A diverse coalition of thirty-one industry partners
  - Successfully applied Zero Energy Homes program within Building America



# ConSol: Building America & ZEH

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- **A Zero Energy Home Program Home**
  - Reduce the total energy bills by over 60%
  - Produce as much electricity as it consumes annually
- Builders opted into building Zero Energy Homes in three ways:
  1. As an option, leaving the sales agent to sell the benefits of ZEH
  2. By building a designated number of preplotted lots to ZEH standards
  3. By building the entire community to ZEH standards



# Example Community: Sacramento (2004)

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- Excellent Envelope
- High AFUE, SEER
  - Ducts buried in insulation
- EnergyStar Appliances
- Fluorescent Lighting
- 36% w/o PV;  
50% w/ 2kW BIPV



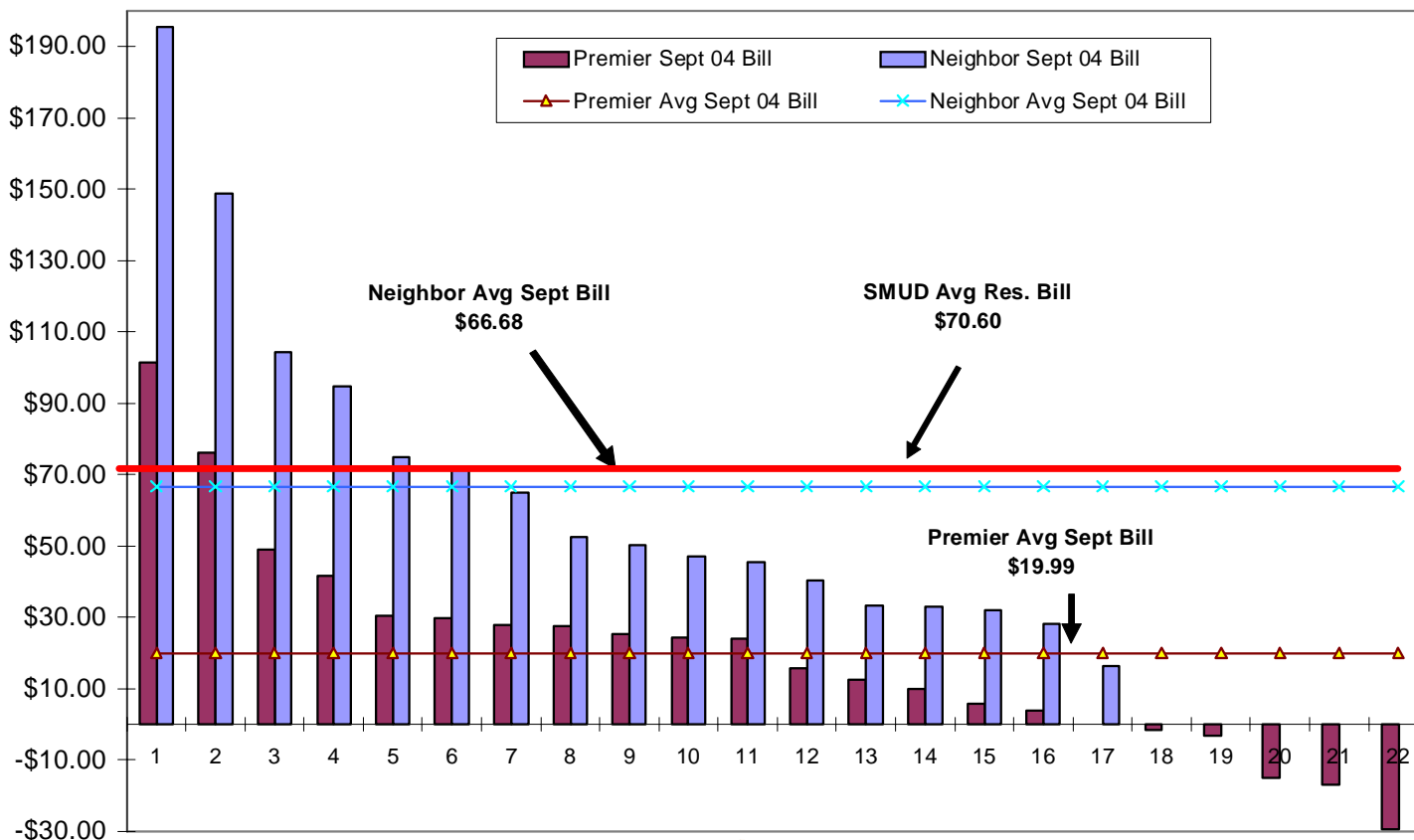
Premier Gardens

# Premier Gardens



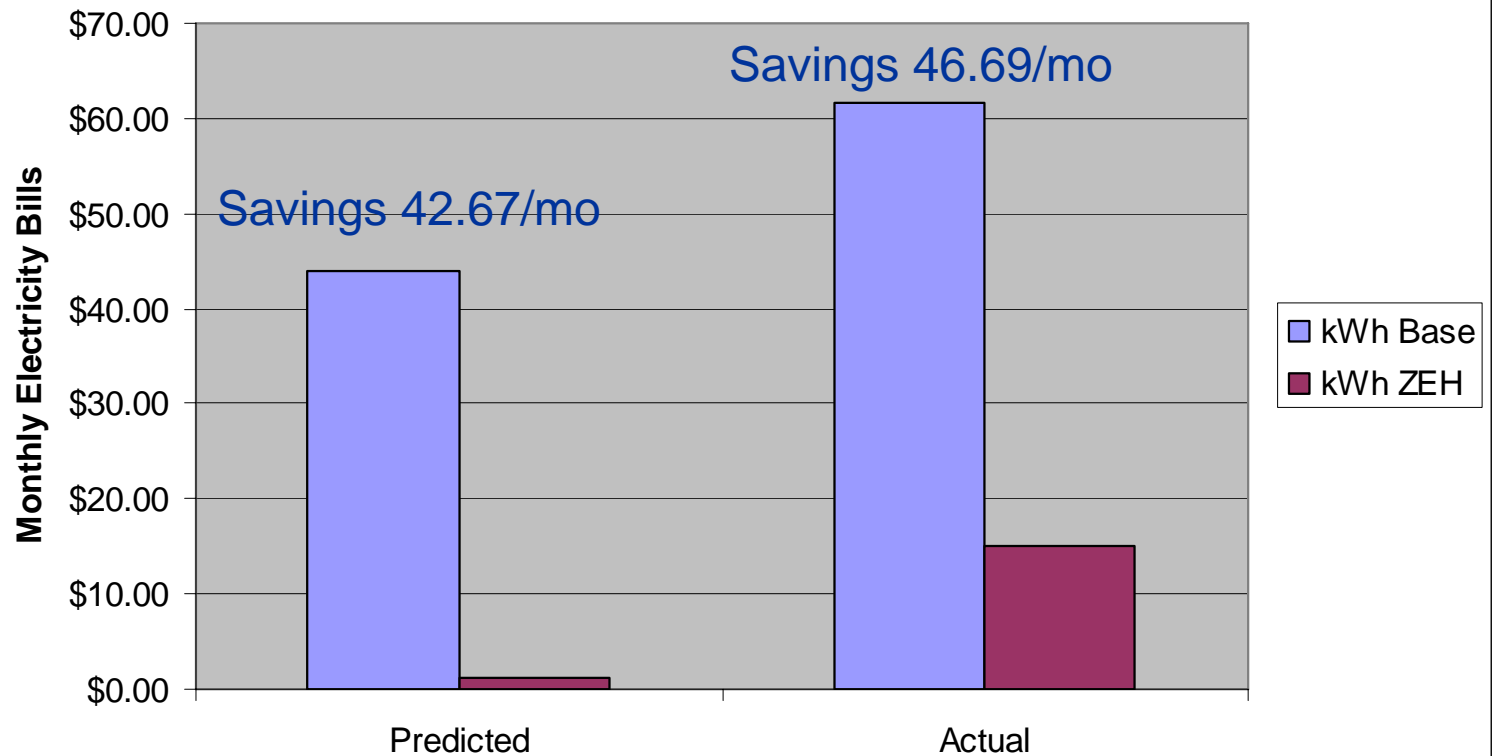
# Premier Gardens

Premier vs Neighbor Sept 04 Electric Bills



# Premier Gardens

Electricity Use: Typical Homes vs ZEH Program Homes



# Prototype: Las Vegas, NV

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- T~Mass Walls, Exposed~Mass Floors
- Excellent Windows
- Freus Water~Cooled AC
  - Ducts in conditioned space
- Energy Star Appliances
- All~Fluorescent Lighting
- 5kW BIPV
- Est. 99% Whole~House Savings



# Pinnacle Homes: LV

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- Side-by-Side Homes
  - Standard model
  - ZEH
- Monitoring
  - Floors, walls
  - Slab-on-grade insulated & un-insulated
  - Energy: total, end-uses, draws
  - PV generation
  - Tankless for space heat & DHW
  - Water savings
  - Off peak cooling w/ T-Mass & slab floor



# Building America ~ Case Studies

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- Building America Case Studies ~
  - Builder's perspective on what it means to build high performance homes under the Building America Program
  - Inform & motivate other builders (and buyers) in constructing (and buying) high performance homes



# Building America ~ Case Studies

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- Building America Case Studies cont. ~
  - Linked to climate-specific Houses that Work – distillations of:
    - Construction details, methods, & building science from the Building Science Corporation's Builder Guides
    - Reviewing all of the Houses that Work is a great start in understanding what aspects of construction change from one hygrothermal zone to the next & why ...



# Building America ~ Builder Guides

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## ○ Builder Guides ~

- Building America's system design recommendations & process improvements can help all builders interested in re-engineering their home designs to achieve high performance

**30,314 Homes Built in Building America Research Projects**

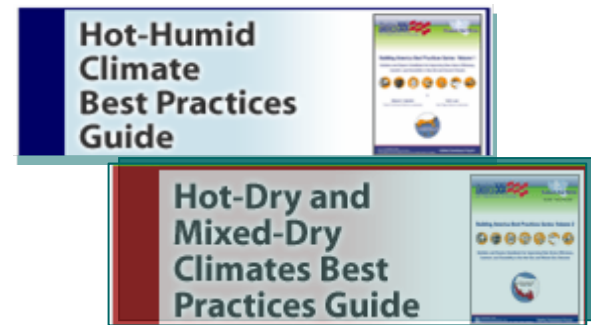


# Building America ~ Builder Guides

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## ○ Builder Guides ~

- Builders and Buyers Handbook for Improving:
  - New Home Efficiency
  - Comfort
  - Durability in the
    - Hot-Dry & Mixed-Dry Climate
    - And Hot-Humid Climate



# Building America ~ Builder Guides

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## ○ Builder Guides ~

- Best practices handbook's help builders develop durable, comfortable homes that achieve 30% energy savings in:

- Space conditioning & water heating in

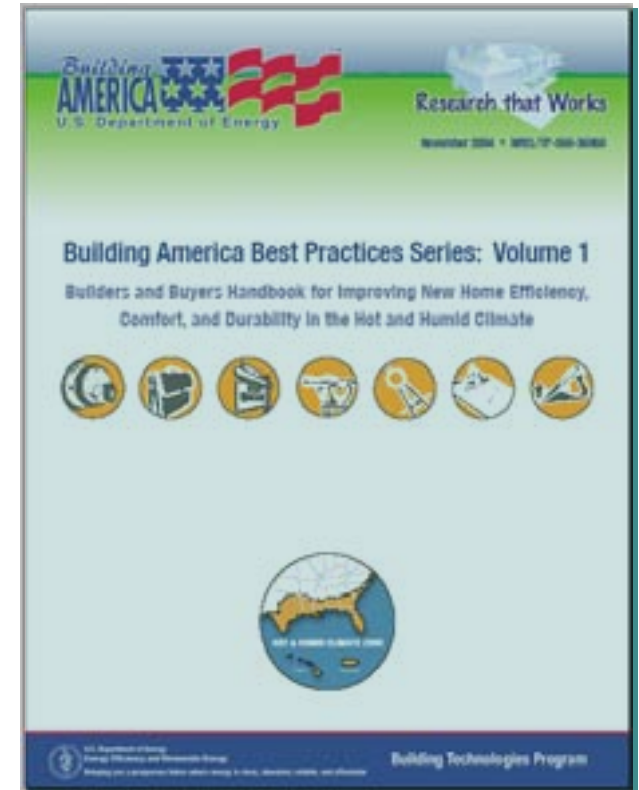
- Hot-dry and mixed-dry climates
- And hot-humid climates



# Building America ~ Builder Guides

## ○ Builder Guides ~

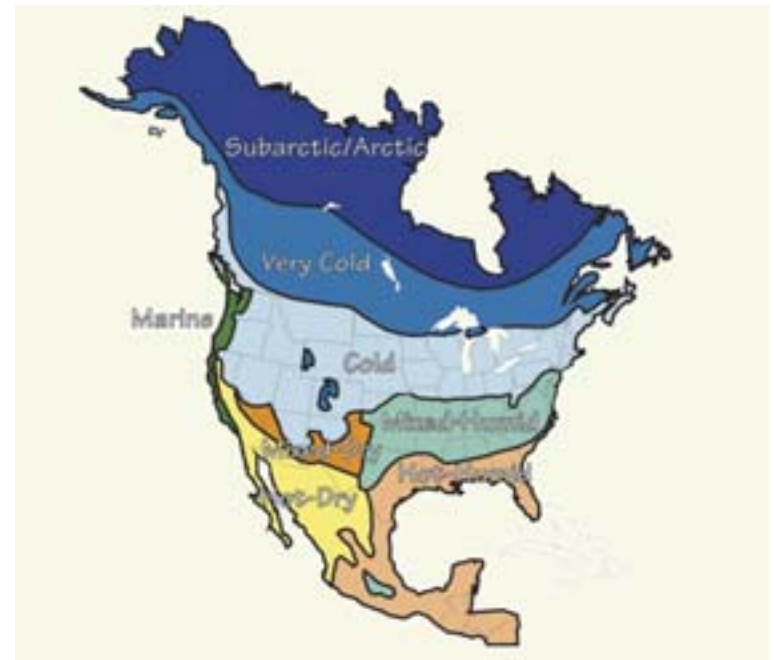
- The handbooks contain chapters for every member of the builder's team—from:
  - Managers to
  - Site planners to
  - Designers
  - Site supervisors
  - The trades
  - And marketers
  - There is also a chapter to help homeowners select the best systems for their new home



# Building America ~ Builder Guides

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- Cold/Very Cold Climate Builders Guide is currently being developed
- Next efficiency level of “Hot & Dry” Climate Builders Guide is soon to be in the making



# Building America ~ Builder Guides

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## ○ Builder Guides ~

- These guides include hundreds of pages of illustrations & resources on such subjects as:

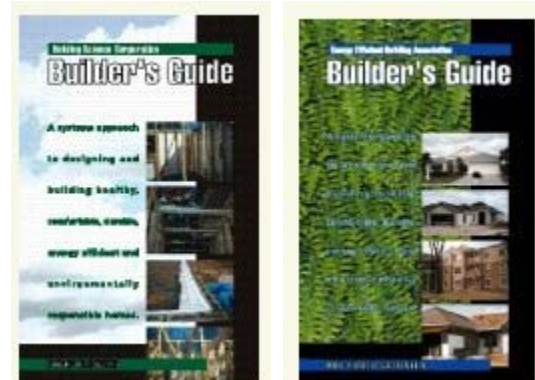
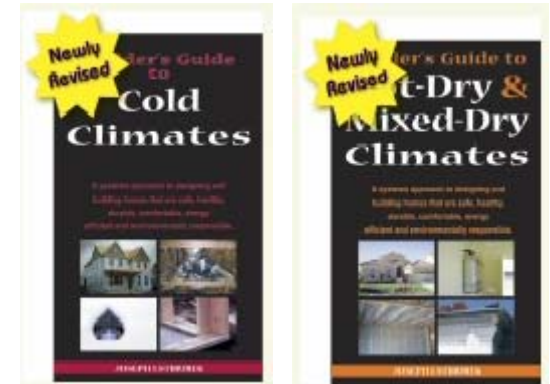
- House layout & design
- Foundations
- Framing
- HVAC
- Insulation
- Drywall
- Plumbing
- Electrical systems
- Painting
- Sheathings
- Windows

*All with respect to moisture control,  
energy efficiency & proper ventilation*



# Building America ~ EEBA Builder Guides

- Builder Guides ~
  - Building Science Corporation publishes a *Builder's Guide* for four different climates –
    - Cold (heating)
    - Hot-humid
    - Hot-dry/mixed-dry (cooling)
    - Mixed-humid (heating and cooling)



# Builders Guides Coming ~ Schedule

Climate Region						
Energy Savings	Marine	Hot Humid	Hot/Mixed Dry	Mixed Humid	Cold	Severe Cold
30%	2006	2006	2005	2006	2005	
40%	2007	2007	2006	2008	2007	
50%	2008	2009	2009	2010	2010	



# Thank You

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